Introduction to AGWA
The Automated Geospatial Watershed Assessment Tool

Modeling post-fire rehabilitation using the Land Cover Modification Tool

Introduction:	In this exercise you will identify all watersheds affected by a fire and you will assess a simulated fire treatment to a burned watershed using the Land Cover Modification Tool.
Goal:	To familiarize you with the Area of Interest delineation feature and with the Land Cover Modification Tool for use as a fire treatment analysis tool.
Assignment:	Identify watersheds affected by a fire. Run the KINEROS model parameterized with post-fire land cover, then modify the land cover using the Land Cover Modification Tool to parameterize the models with treated, post-fire land cover.

Background

Wildfires can, and have had, a profound impact on the nature of watershed response to precipitation (DeBano et al. 1998). Increases in peak runoff rate and volume, as well as sediment discharge, typically increase following fires, (Robichaud, et al. 2000; Anderson et al. 1976). Mitigating these effects is one of the primary objectives of the Burned Area Emergency Response (BAER) teams. Weather and climatic conditions often force these teams to make rapid post-fire assessments for decision-making on how and where to deploy remediation measures. Building and running distributed hydrological models to predict potential impacts of fire on runoff and erosion can be a time-consuming and tedious task. The USDA-ARS Southwest Watershed Research Center, in cooperation with the U.S. EPA Office of Research and Development, and the University of Arizona have developed the AGWA geographic information system (GIS) based tool to facilitate this process. A GIS provides the framework within which spatially-distributed data are collected and used to prepare model input files and evaluate model results in a spatially explicit context.

The Study Area

The Aspen Fire in June of 2003 burned 84,750 acres on Mount Lemmon. Mount Lemmon is located in the Santa Catalina Mountains north of Tucson, AZ (Figure 1). The burned area intersects several drainages on the mountain, including Molino Canyon, Sabino Canyon, Ventana Canyon, Romero Canyon, Canyon Del Oro, Peppersauce Wash, Catalina Wash, and Stratton Wash. This exercise will focus on the impacts of the fire on the Marshall Gulch watershed (873 ha), a subwatershed of the larger Sabino Canyon watershed (16,478 ha).

The Land Cover Modification Tool in AGWA will be used to create a treated version of the National Land Cover Data 2001 (NLCD 2001) already modified to represent the effects of the fire. The post-fire NLCD 2001 dataset and the treated, post-fire NLCD 2001 dataset will be used to parameterize the KINematic Runoff and EROSion Model (KINEROS2; Semmens et al., 2008; www.tucson.ars.ag.gov/kineros). A discussion on the selection of parameter values used to parameterize the model for simulating post-fire runoff and sediment transport is presented by Canfield et al. (2005)* and Goodrich et al. (2005).

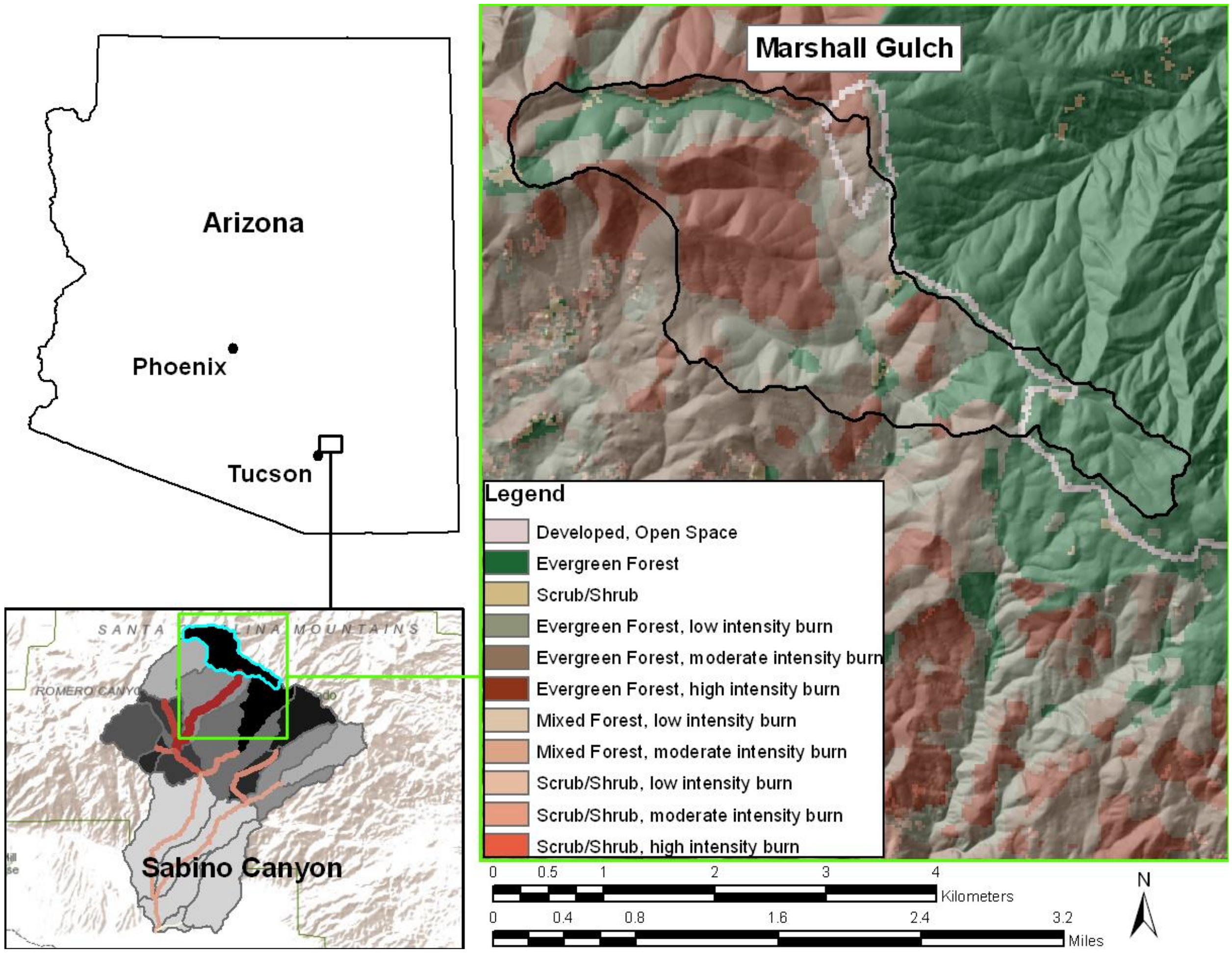


Figure 1. Location Map of the study area, near Tucson, Arizona.

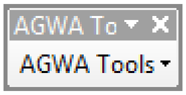
This exercise examines the effects of a typical fire treatment on the hydrology of a particular burned watershed in the Santa Catalina Mountains. The results disclose potential immediate changes to the hydrologic regime that are attributable to effective recovery efforts. Changes include the reduction in sediment yield and decrease of higher runoff peaks.

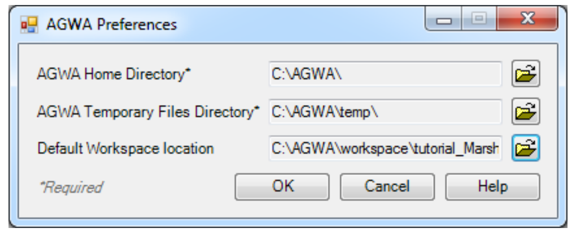
Getting Started

Start ArcMap with a new empty map. Save the empty map document as **tutorial_MarshallGulchRehabilitation** in the

* Available in PDF format on the AGWA website, http://www.tucson.ars.ag.gov/agwa/.

C:\AGWA\workspace\tutorial_MarshallGulchRehabilitation directory (you may need to create the tutorial_MarshallGulchRehabilitation folder). If the ***AGWA Toolbar*** is not visible, turn it on by selecting ***Customize > Toolbars > AGWA Toolbar*** on the ArcMap Main Menu bar. Once the map document is opened and saved, set the Home, Temp, and Default Workspace folders by selecting ***AGWA Tools > Other Options > AGWA Preferences*** on the ***AGWA Toolbar***.





- Home: **C:\AGWA**
- Temp: **C: \AGWA\temp**
- Default Workspace:
  C:\AGWA\workspace\tutorial_MarshallGulchRehabilitation
  The default workspace location will need to be created by clicking on ***Make New Folder*** button in the window that opens.

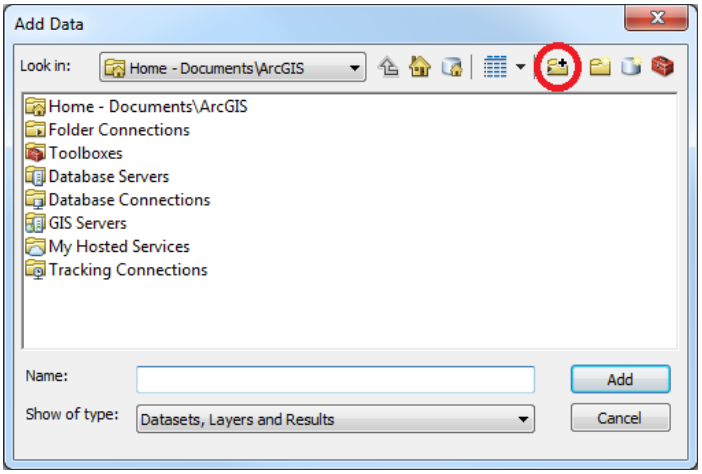
The Home folder contains all of the look-up tables, datafiles, models, and documentation required for AGWA to run. If this is set improperly or you are missing any files, you will be presented with a warning that lists the missing folders or files that AGWA requires.

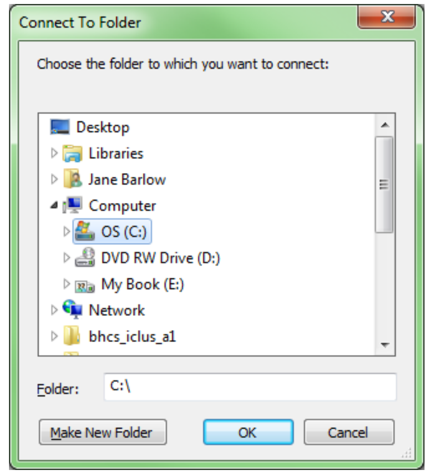
The Temp folder is where some temporary files created during various steps in AGWA will be placed. You may want to routinely delete files and folders in the Temp folder if you need to free up space or are interested in identifying the temporary files associated with your next AGWA use.

The Default Workspace folder is where delineation geodatabases will be stored by default. This can be a helpful timesaver during the navigation process if you have a deeply nested folder structure where you store AGWA outputs.

GIS Data

Before adding data to the map, connections to drives and folders where your data are stored must be established if they have not been already. To establish folder connections if they don't already exist, click on the ***Add Data*** button  below the menu bar at the top of the screen. In the Add Data form that opens, click the ***Connect To Folder*** button and select **OS (C:)**.





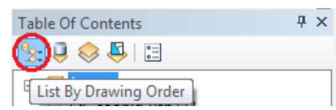
Once the folder connection is established, navigate to the **C:\AGWA\gisdata\tutorial_MarshalGulchRehabilitation** folder and add the following datasets and layers:

- **..AOI Inputs.gdb\Boundary**
- **..AOI Inputs.gdb\Extent**
- **..AOI Inputs.gdb\streams10000**
- **..\demf**
- **..\facg**
- **..\fdg**
- **..\hillshade**
- **..\marshall_gulch_outlet.shp**
- **..\postfire**
- **..\treatment.shp**
- **..\gsmsoil_az\spatial\gsmsoilmu_a_az.shp**

You will also need to add some other data to the project. To do this, again click on the ***Add Data*** button. Navigate to the **C:\AGWA\datafiles** folder and add the following files:

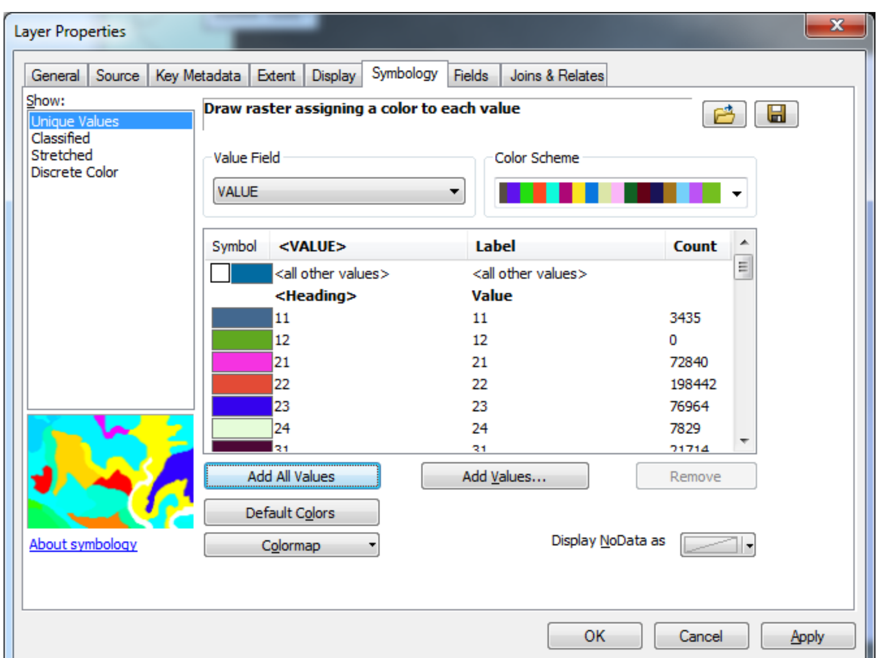
- **..\lc_luts\mrlc2001_lut_fire.dbf** – MRLC look-up table for post-fire and treated NLCD land cover

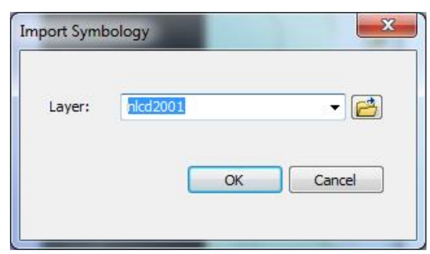
To better visualize the different land cover types and associate the pixels with their classification, load a legend into the ***postfire*** datasets. To do this, right click the layer name of the **postfire** dataset in the ***Table of Contents*** and select ***Properties*** from the context menu that appears. Select the ***Symbology*** tab from the form that opens. In the ***Show*** box on the left side of the form, select ***Unique Values*** and click the ***Import*** button on the right. Click the file browser button, navigate to and select **C:\AGWA\datafiles\renderers\nlcd2001.lyr** and click on ***Add***, and click ***OK*** to apply the symbology and exit the ***Import Symbology*** form. Click on ***Apply*** in the ***Layer Properties*** form and then on ***OK*** to exit this form.



Take a look at the data you have available to you to familiarize yourself with the area. Layers can be reordered, turned on/off, and their legends collapsed to suit your preferences and clean up the display. If the layers cannot be reordered by clicking and dragging, the ***List By Drawing Order*** button may need to be selected at the top of the ***Table Of Contents***. Zoom back into the Santa Catalinas region by right-clicking on the ***demf*** grid in the list of layers and selecting ***Zoom To Layer***.

Save the map document and continue.



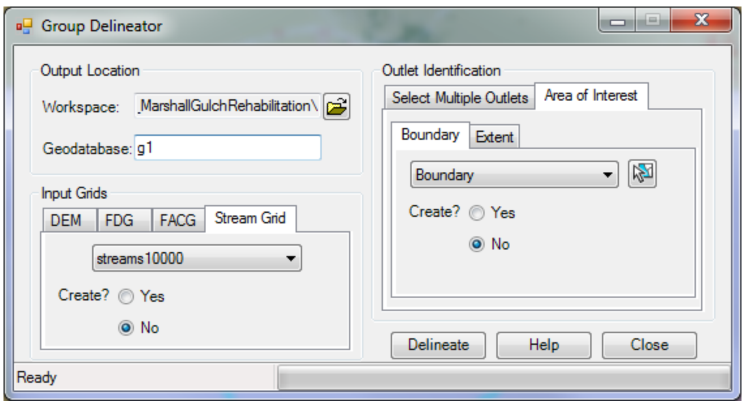


Part 1: Determining Watersheds Affected by the Fire

In Part 1, the drainages intersecting the study area will be delineated to show the watersheds impacted by the fire. The delineated group watersheds will not be used further as the rest of the exercise will focus on a specific watershed and one of its subwatersheds that both intersect the burn area.

1. Perform the watershed delineation by selecting ***AGWA Tools > Delineation Options > Delineate Group Watershed***.

   DESCRIPTION In the ***Group Delineator*** form, several parameters are defined including the output location, the name of the delineation, the digital elevation model (DEM), the flow direction grid (FDG), the flow accumulation grid (FACG), the watershed outlet location, and a search radius from the outlet location which AGWA will use to locate the most downstream location to use as the watershed outlet.



   1.1. ***Output Location*** box

      1.1.1. ***Workspace*** textbox: navigate to and select/create **C:\AGWA\workspace\tutorial_MarshallGulchRehabilitation**

      DESCRIPTION The workspace specified is the location on your hard drive where the delineated watershed is stored as a feature class in a geodatabase.

      1.1.2. ***Geodatabase*** textbox: **g1**

      NOTE You will be required to change the name of the geodatabase if a geodatabase with the same name exists in the selected workspace.

   1.2. ***Input Grids*** box

      1.2.1. ***DEM*** tab: **demf** (do not click Fill)

      1.2.2. ***FDG*** tab: **fdg** (do not click Create)

      1.2.3. ***FACG*** tab: **facg** (do not click Create)

      1.2.4. ***Stream Grid*** tab: **streams10000** and the ***No*** radiobutton

   1.3. ***Outlet Identification*** box

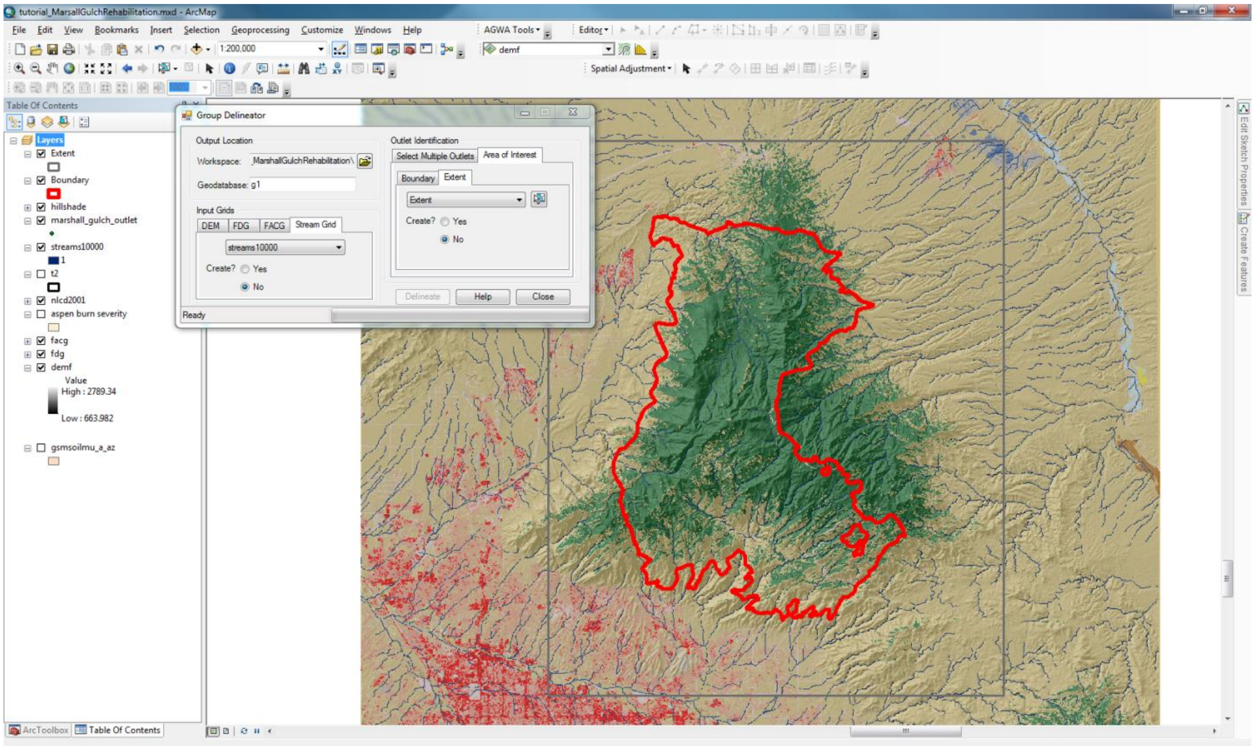
      1.3.1. ***Select Area of Interest*** tab

         1.3.1.1. ***Boundary tab***: **Boundary**

            1.3.1.1.1. Click the ***Select Features*** button and drag a box around the Boundary shape, and Click the ***No*** radiobutton

         1.3.1.2. ***Extent tab***: **Extent**

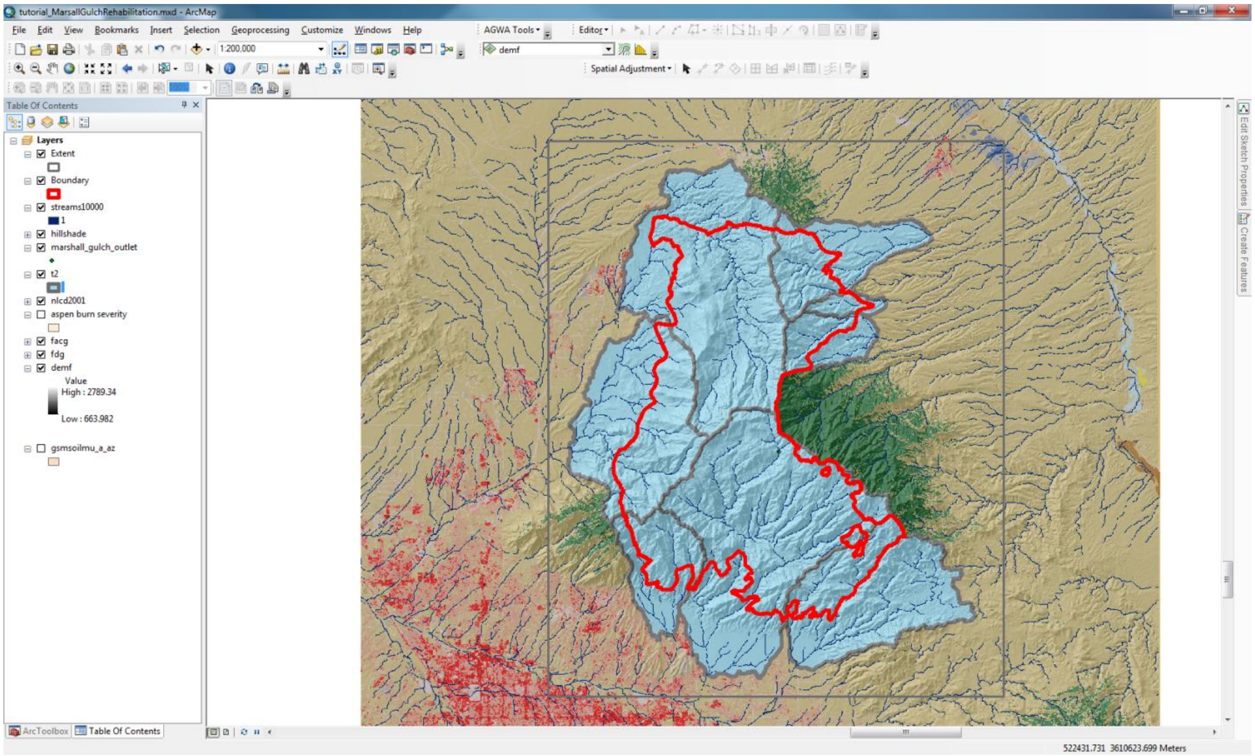
1.3.1.2.1. Click the ***Select Features*** button and drag a box around the Extent layer rectangle, and Click the ***No*** radiobutton



1.4. Click ***Delineate***.

1.5. Save the map document and continue.

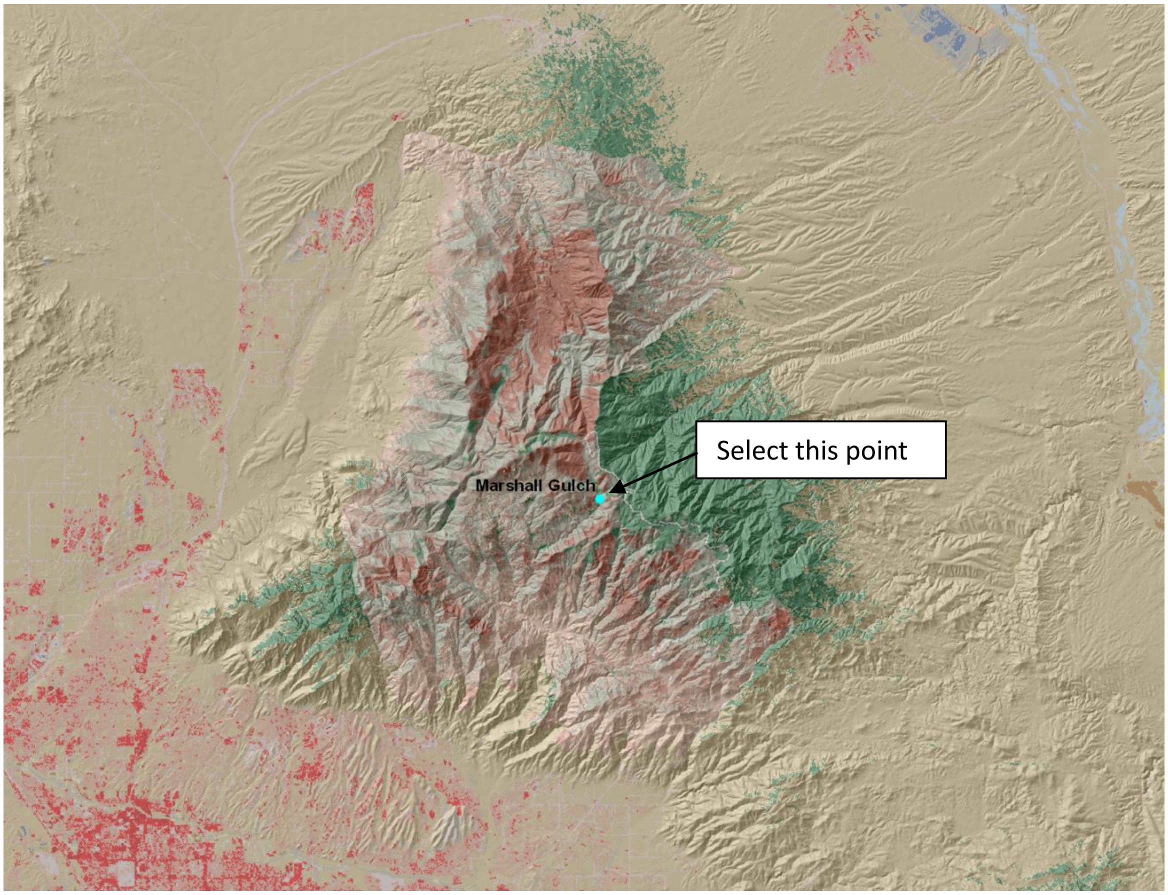
At this point, the area of interest watersheds are delineated and depict the extent of the watersheds affected by the fire. Post-fire conditions will be simulated in part 2; treated, post-fire land cover will be created in part 3; and then treated, post-fire conditions will be simulated in part 4 so that analysis can be performed in part 5.



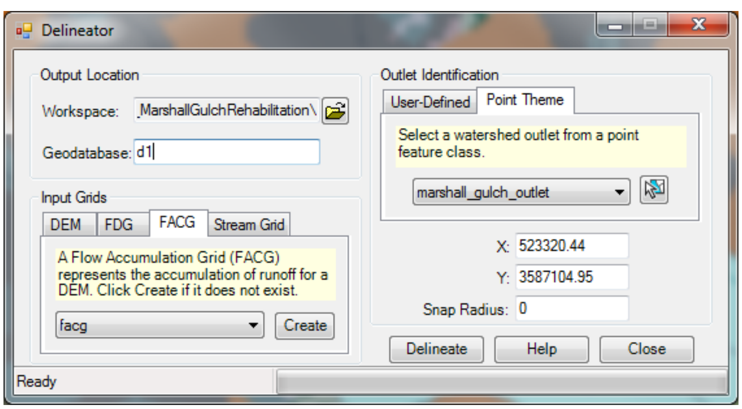
Part 2: Modeling Runoff in Study Area Using Existing Post-Fire Land Cover

Step 1: Delineating the watershed

Delineating creates a feature class that represents the entire area draining to a user-specified outlet.



2. Perform the watershed delineation by selecting ***AGWA Tools > Delineation Options > Delineate Watershed***.



2.1. ***Output Location*** box

2.1.1. ***Workspace*** textbox: navigate to and create/select
C:\AGWA\workspace\tutorial_MarshallGulchRehabilitation
2.1.2. ***Geodatabase*** textbox: **d1**

2.2. ***Input Grids*** box
2.2.1. ***DEM*** tab: **demf** (do not click Fill)
2.2.2. ***FDG*** tab: **fdg** (do not click Create)
2.2.3. ***FACG*** tab: **facg** (do not click Create)

2.3. ***Outlet Identification*** box
2.3.1. ***Point Theme*** tab
2.3.2. ***Outlets Theme***: **marshall_gulch_outlet**
2.3.3. Click the ***Select Feature*** button and draw a rectangle around the ***Marshall Gulch*** point (see map above).

2.4. Click ***Delineate***.

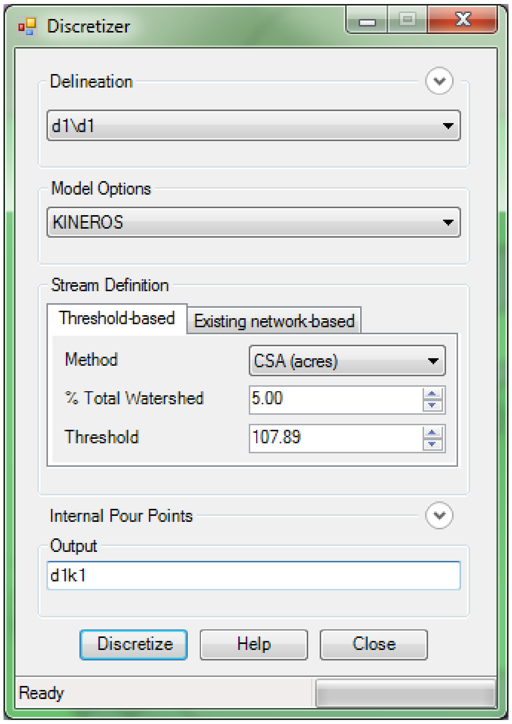
2.5. Save the map document and continue.

Step 2: Discretizing or subdividing the watershed

Discretizing breaks up the delineated watershed into model specific elements and creates a stream feature class that drains the elements.

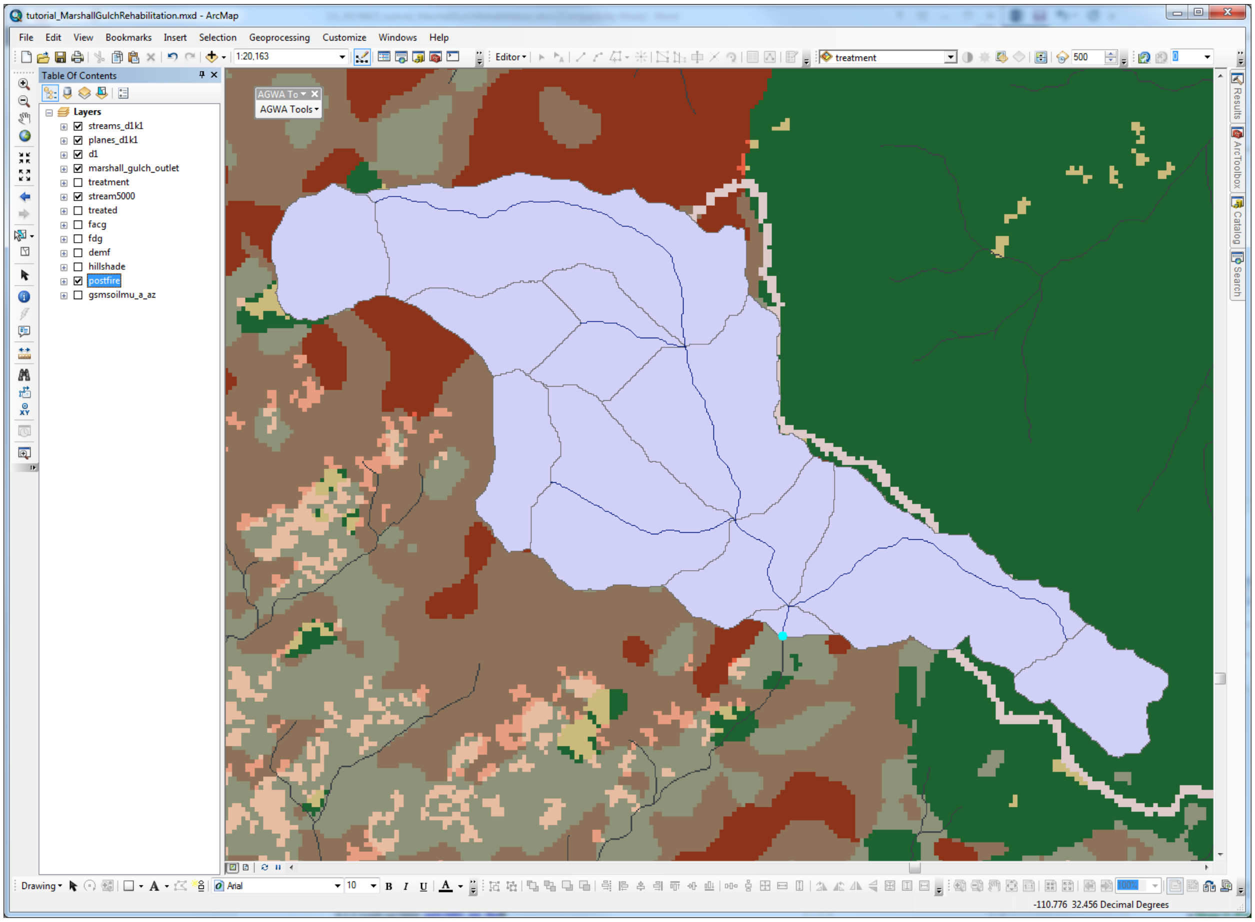
3. Perform the watershed discretization by selecting ***AGWA Tools > Discretization Options > Discretize Watershed***.
DESCRIPTION In the Discretizer form, several parameters are defined including the model to use, the complexity of the discretization, the name of the discretization, and whether additional pour

points will be used to further control the subdivision of the watershed.



3.1. ***Input*** box
   3.1.1. ***Delineation***: **d1\d1**
3.2. ***Model Options*** box
   3.2.1. ***Model***: **KINEROS**
3.3. ***Stream Definition*** box
   3.3.1. ***Method***: **CSA (Acres)**
   3.3.2. ***% Area***: **5**
   3.3.3. ***Threshold***: do nothing (it should read ***107.89*** after changing the ***% Area*** to 5)
3.4. ***Output*** box
   3.4.1. ***Name***: **d1k1**
3.5. Click ***Discretize***.
3.6. Save the map document and continue.

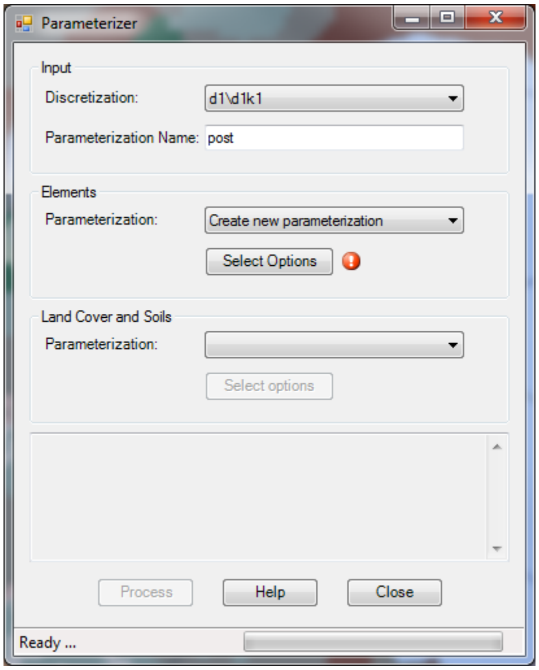
Discretizing breaks up the delineation/watershed into model specific elements and creates a stream feature class that drains the elements. The CSA, or Contributing/Channel Source Area, is a threshold value which defines first order channel initiation, or the upland area required for channelized flow to begin. Smaller CSA values result in a more complex watershed, and larger CSA values result in a less complex watershed. The default CSA in AGWA is set to 2.5% of the total watershed area. The discretization process created a subwatersheds layer with the name subwatersheds_d1s1 and a streams map named streams_d1s1. In AGWA discretizations are referred to with their geodatabase name as a prefix followed by the discretization name given in the Discretizer form, e.g. d1\d1s1.

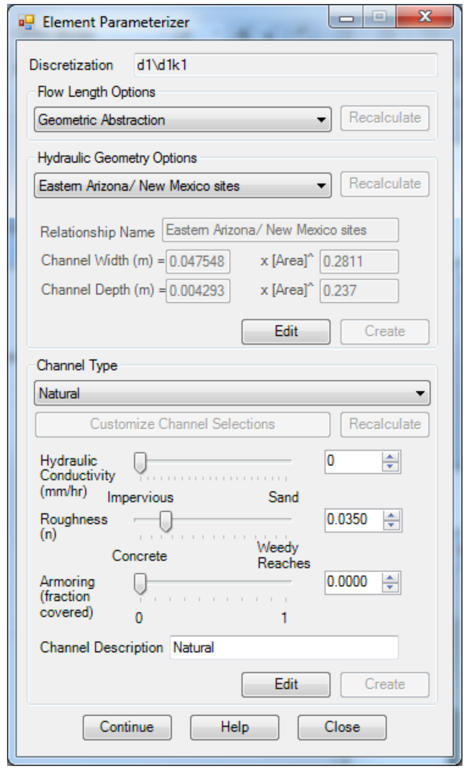


Step 3: Parameterizing the watershed elements for KINEROS

Parameterizing defines model input parameters based on topographic, land cover, and soils properties. Model input parameters represent the physical properties of the watershed and are used to write the model input files.

4. Perform the element, land cover, and soils parameterization of the watershed by selecting ***AGWA Tools*** > ***Parameterization Options*** > ***Parameterize***.
   4.1. ***Input*** box
      4.1.1. ***Discretization***: **d1\d1k1**
      4.1.2. ***Parameterization Name***: **post**
   4.2. ***Elements*** box
      4.2.1. ***Parameterization***: **Create new parameterization**
      4.2.2. Click ***Select Options***. The ***Element Parameterizer*** form opens.





4.3. In the ***Element Parameterizer*** form

4.3.1. ***Flow Length Options*** box

4.3.1.1. Select the **Geometric Abstraction** item.

4.3.1.2. ***Hydraulic Geometry Options*** box: Select the **Eastern Arizona/New Mexico sites** item.

Do not click the ***Recalculate*** button.

Do not click the ***Edit*** button.

Hydraulic geometry relationships define bankfull channel width and depth based on watershed size. Bankfull relationships are useful in that they define channel topography with minimal input and effort by the user; however, there are some drawbacks. The relationships are designed to be applied to very specific physiographic regions and outside of these regions the performance of the relationships in accurately depicting the channel geometries severely declines. In a BAER rapid assessment situation, it may be best to take field measurements to double-check the accuracy of the predefined hydraulic geometries. Field measurements by the Aspen Fire BEAR team found the Eastern Arizona/New Mexico relationships to fit reasonably well, so it is used here.

4.3.1.3. ***Channel Type*** box:

4.3.1.3.1. Select the **Natural** item.

4.3.1.3.2. Click the ***Edit*** button.

4.3.1.3.3. Change the ***Hydraulic Conductivity*** to **0**.

4.3.1.3.4. Do not change the ***Roughness*** and ***Armoring*** values.

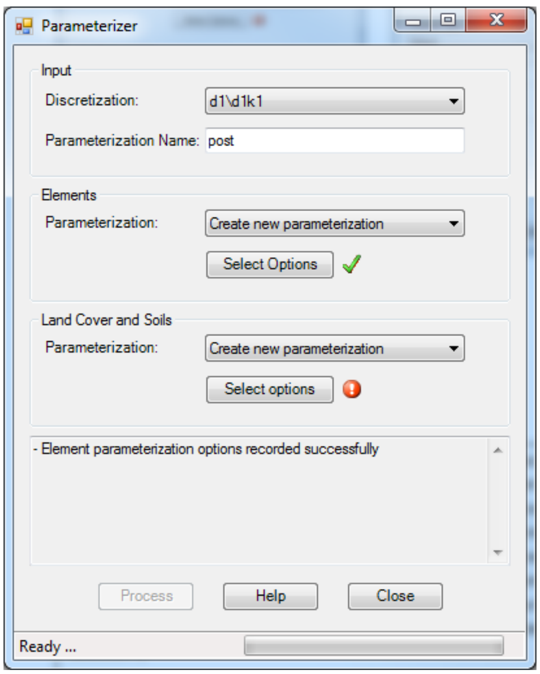
There are three channel types available by default: Default, Natural, and Developed. The Default channel type is equivalent to the Natural channel type. The Natural channel type reflects a sandy channel bottom with high infiltration and a winding but clean channel with roughness set to 0.035 Manning's n. The Developed channel type reflects a concrete channel with zero infiltrability, very low roughness set to 0.010 Manning's n, and fraction of channel armored against erosion equal to 1. Since Marshall Gulch is a natural but perennial stream, the Natural default hydraulic conductivity of 210 is not realistic. Instead, the value was reduced using the provided trackbar or numerical textbox.

4.3.2. Click ***Continue***. You will be returned to the ***Parameterizer*** form to create the Land Cover and Soils parameterization.

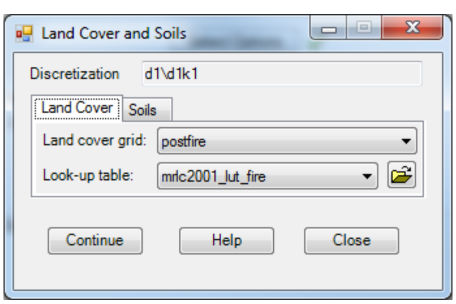
4.4. Back in the ***Land Cover and Soils*** box of the ***Parameterizer*** form

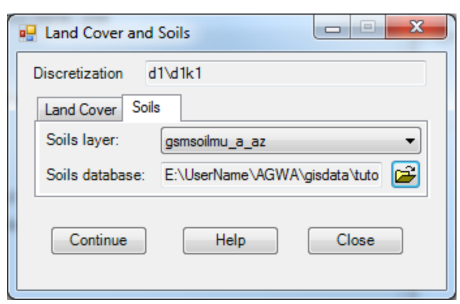
4.4.1. ***Parameterization***: **Create new parameterization**

4.4.2. Click ***Select Options***. The ***Land Cover and Soils*** form opens.



4.5. In the ***Land Cover and Soils*** form





4.5.1. ***Land Cover*** tab

4.5.1.1. ***Land cover grid***: **postfire**

4.5.1.2. ***Look-up table***: **mrlc2001_lut_fire**

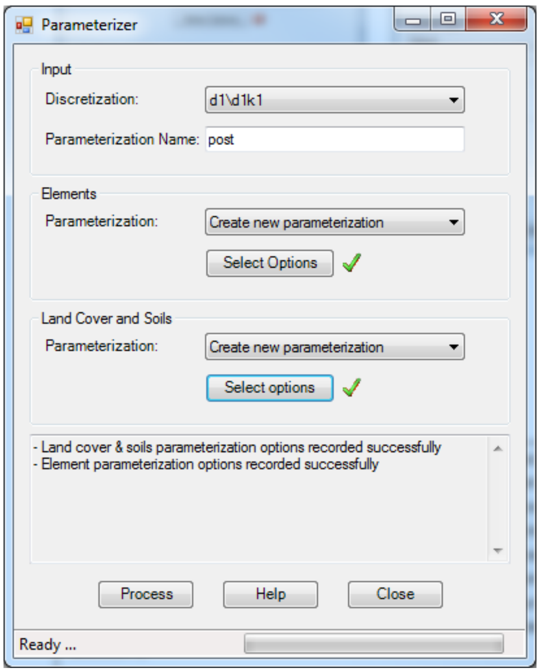
NOTE If the ***mrlc2001_lut_fire*** table is not present in the combobox, you may have forgotten to add the table to the map earlier. If this is the case, click on the ***Add Data*** button and browse to the **C:\AGWA\datafiles\lc_luts** folder and select **mrlc2001_lut_fire**, then select the **mrlc2001_lut_fire** table from the combobox.

4.5.2. ***Soils*** tab

4.5.2.1. ***Soils*** layer: **gsmsoilmu_a_az**

4.5.2.2. ***Soils database***: navigate to and select **C:\AGWA\gisdata\tutorial_MarshalGulchRehabiliation\gsmsoil_az\soildb_US_2002.mdb**

4.6. Click ***Continue***. You will be returned to the ***Parameterizer*** form where the ***Process*** button will now be enabled.



4.7. In the ***Parameterizer*** form, click ***Process***.

In the last step, parameterization look-up tables for the overland flow elements and stream elements have been created to store the model input parameters representing the physical properties of the watershed.

Step 4: Preparing rainfall files

Two different average return periods will be used to demonstrate the impacts of different size events. An abridged table from NOAA's National Weather Service Precipitation Frequency Data Server (PFDS, http://hdsc.nws.noaa.gov/hdsc/pfds/) for the Marshall Gulch rain gage location (32.419874N, 110.751911W) is presented below. The 2 year, 1 hour and 50 year, 1 hour events will be used.

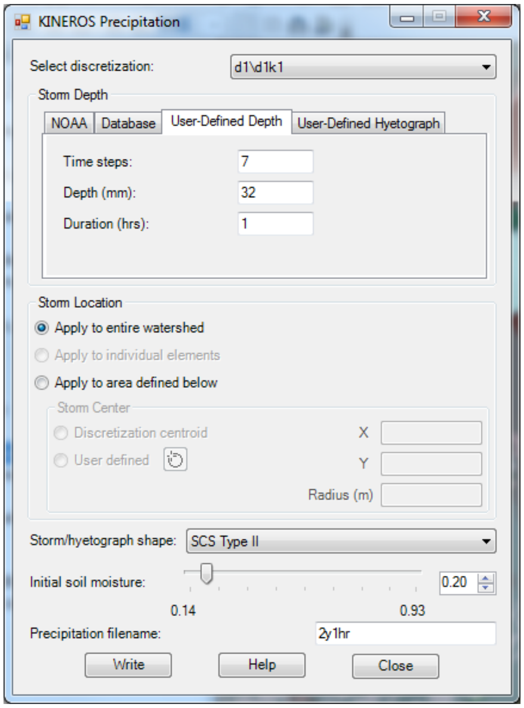
Precipitation Frequency Estimates (mm)										
ARI* (years)	**5 min**	**10 min**	**15 min**	**30 min**	**60 min**	**120 min**	**3 hr**	**6 hr**	**12 hr**	**24 hr**
1	8	12	15	20	25	29	32	38	46	50
2	10	16	19	26	32	37	41	48	57	62
5	14	21	25	34	42	48	52	60	71	78
10	16	24	30	40	50	57	61	70	83	91
25	19	29	36	48	60	68	73	84	99	110
50	21	32	40	54	67	77	83	96	112	124
100	24	36	45	60	74	86	93	108	126	139
200	26	39	49	66	82	95	104	120	140	155
500	29	44	55	74	91	108	118	137	159	177
1000	31	48	59	80	99	118	130	150	174	195

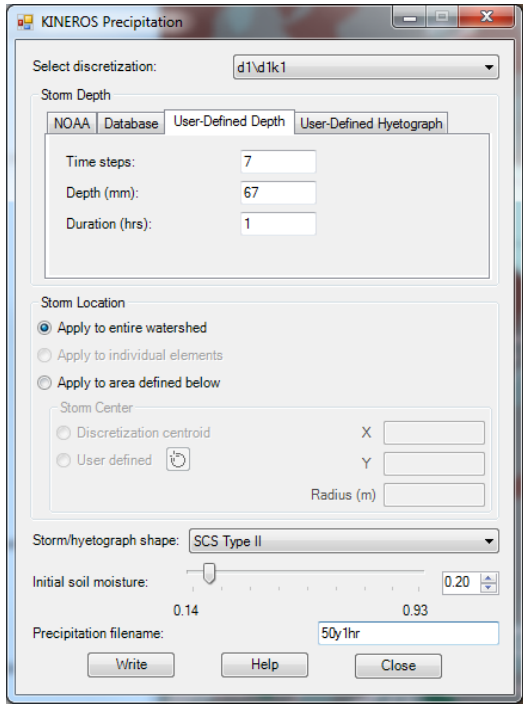
* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

Please refer to the NOAA Atlas 14 Document for more information.

NOTE: Formatting forces estimates near zero to appear as zero.

5. Write the KINEROS precipitation file for the watershed by selecting ***AGWA Tools > Precipitation Options > Write KINEROS Precipitation***.





   5.1. ***KINEROS Precipitation*** form
   5.2. ***Select discretization***: **d1/d1k1**
   5.3. ***Storm Depth*** box:
      5.3.1. ***User-Defined Depth*** tab:
         5.3.1.1. ***Time Steps***: **7**
         5.3.1.2. ***Depth (mm)***: **32**
         5.3.1.3. ***Duration (hrs)***: **1**
   5.4. ***Storm Location*** box:
      5.4.1. Select ***Apply to entire watershed*** radio button
   5.5. ***Storm/hyetograph shape:*** **SCS Type II**
   5.6. ***Initial soil moisture:*** **0.2**
   5.7. Precipitation filename: **2yr1hr**
   5.8. Click ***Write***

6. Repeat for the 50 year, 1 hour event. Select ***AGWA Tools > Precipitation Options > Write KINEROS Precipitation***.
   6.1. ***KINEROS Precipitation*** form
   6.2. ***Select discretization***: **d1/d1k1**
   6.3. ***User-Defined Depth*** tab:
      6.3.1. ***Time Steps***: **7**
      6.3.2. ***Depth (mm)***: **67**
      6.3.3. ***Duration (hrs)***: **1**

6.4. ***Storm Location*** box:

6.4.1. Select***Apply to entire watershed*** radio button

6.5. ***Storm/hyetograph shape:*** **SCS Type II**

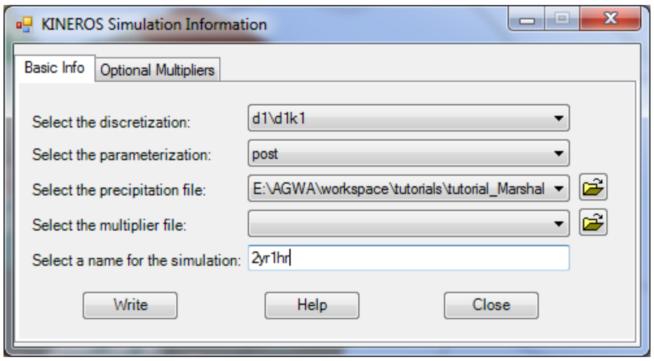
6.6. ***Initial soil moisture:*** **0.2**

6.7. Precipitation filename: **50yr1hr**

6.8. Click ***Write***

Step 5: Writing KINEROS input files

7. Write the KINEROS simulation input files for the watershed by selecting ***AGWA Tools > Simulation Options > KINEROS Options > Write KINEROS Input Files***.



7.1. ***Basic Info*** tab:

7.1.1. ***Select the discretization***: **d1\d1k1**

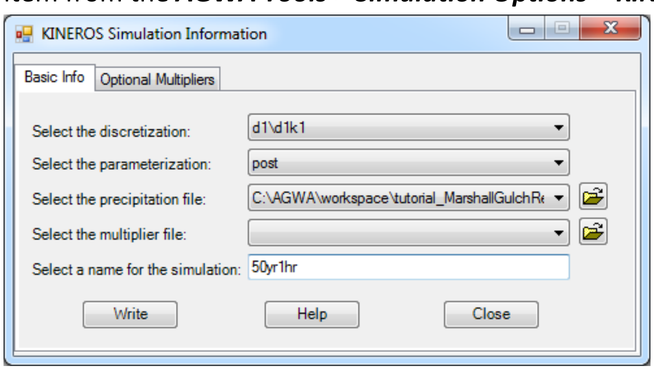
7.1.2. ***Select the parameterizerion***: **post**

7.1.3. ***Select the precipitation file***:**2yr1hr**

7.1.4. Select a name for the simulation: **2yr1hr**

7.1.5. Click ***Write***.

8. Repeat the writing of input files for the 50yr1hr event. Select the ***Write KINEROS Input Files*** menu item from the ***AGWA Tools*** > ***Simulation Options*** > ***KINEROS Options*** menu.



8.1. ***Basic Info*** tab:

8.1.1. ***Select the discretization***: **d1\d1k1**

8.1.2. ***Select the parameterizerion***: **post**

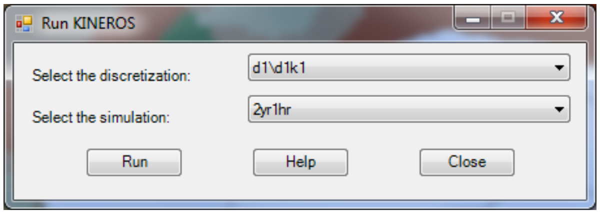
8.1.3. ***Select the precipitation file***: **50yr1hr**

8.1.4. Select a name for the simulation: **50yr1hr**

8.1.5. Click ***Write***.

Step 6: Executing the KINEROS model

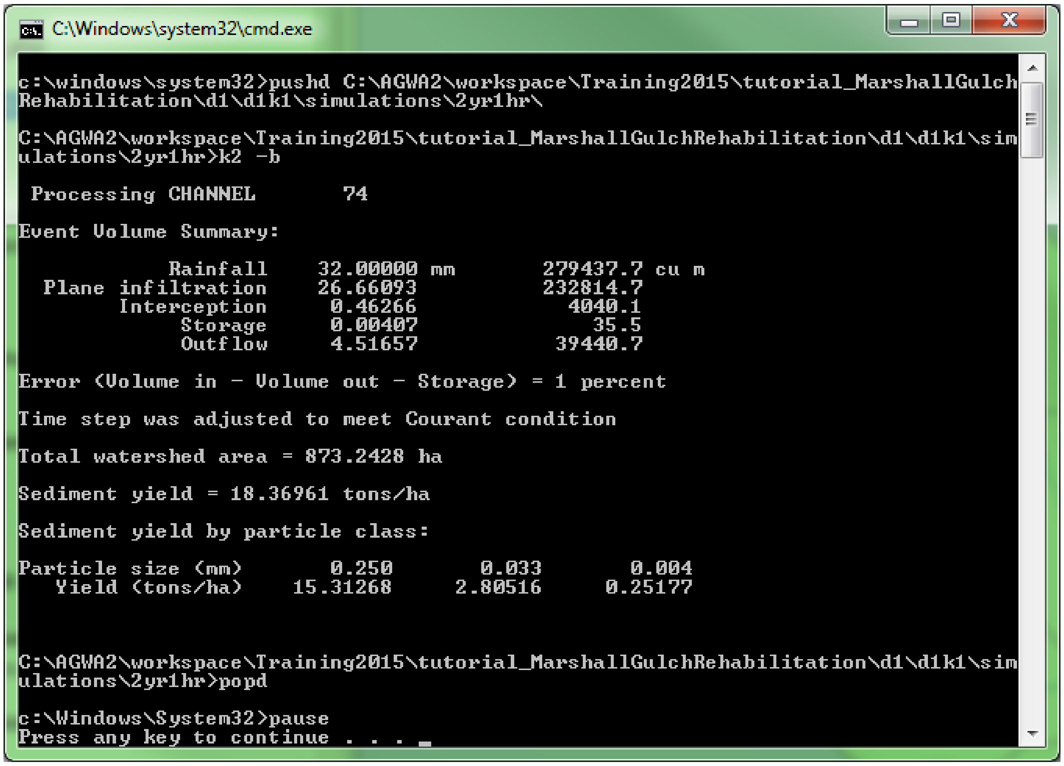
9. Run the KINEROS model for the Marshall Gulch watershed by selecting ***AGWA Tools > Simulation Options > KINEROS Options > Execute KINEROS Model***.



9.1. ***Select the discretization***: **d1\d1k1**

9.2. ***Select the simulation***: **2yr1hr**

9.3. Click ***Run***. The command window will stay open so that successful completion can be verified. Press any key to continue.



10. Repeat for the 50yr1hr event.

10.1. ***Select the discretization***: **d1\d1k1**

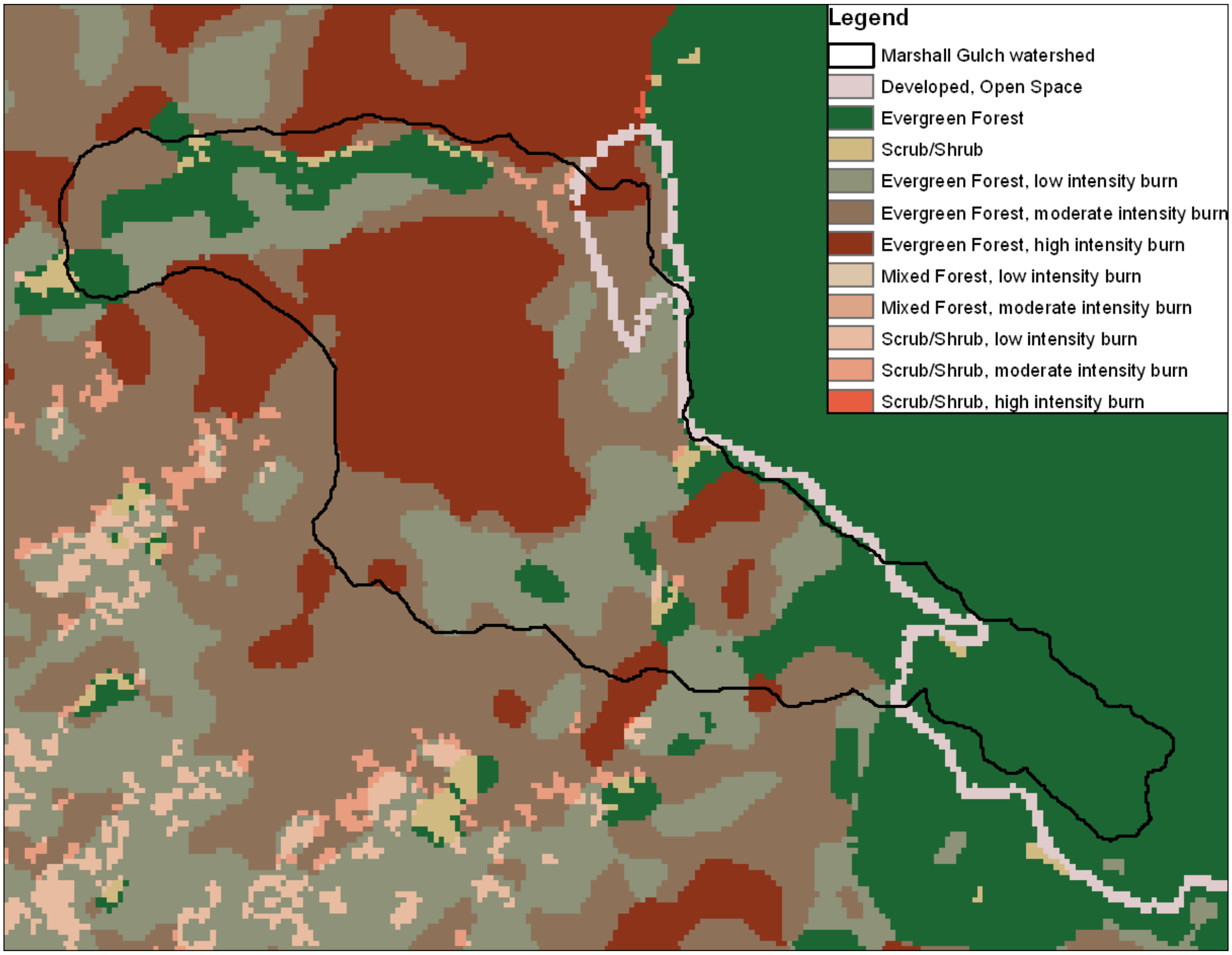
10.2. ***Select the simulation***: **50yr1hr**

10.3. Click ***Run***. The command window will stay open so that successful completion can be verified. Press any key to continue.

At this point, post-fire conditions have been simulated; treated, post-fire land cover will be created in part 3 and then simulated in part 4 so that the analysis can be performed in part 5.

Part 3: Create Treated, Post-Fire Land Cover

In Part 3, the post-fire land cover will be used along with a treatment map to create a treated, post-fire land cover product. The treatment map represents only the location of high burn severities to better focus labor on the more critical areas.



11. Perform the land cover modification for the proposed schools by selecting ***AGWA Tools > Other Options > Land Cover Modification Tool***.
    11.1. ***Input Land Cover*** tab
        11.1.1. ***Land cover grid***: **postfire**
        11.1.2. ***Look-up table***: **mrlc2001_lut_fire**
    11.2. ***Output Land Cover*** tab
        11.2.1. ***Output folder***: navigate to and select **C:\AGWA\workspace\tutorial_MarshallGulchRehabilitation**
        11.2.2. ***New land cover name***: **treated**
    11.3. ***Polygon Definition*** tab
        11.3.1. ***Polygon feature class***: **treatment**
        11.3.2. Create? radiobuttons: **No**

11.3.3. Select the ***Select Features*** tool and drag a box around the features in the selected feature class.

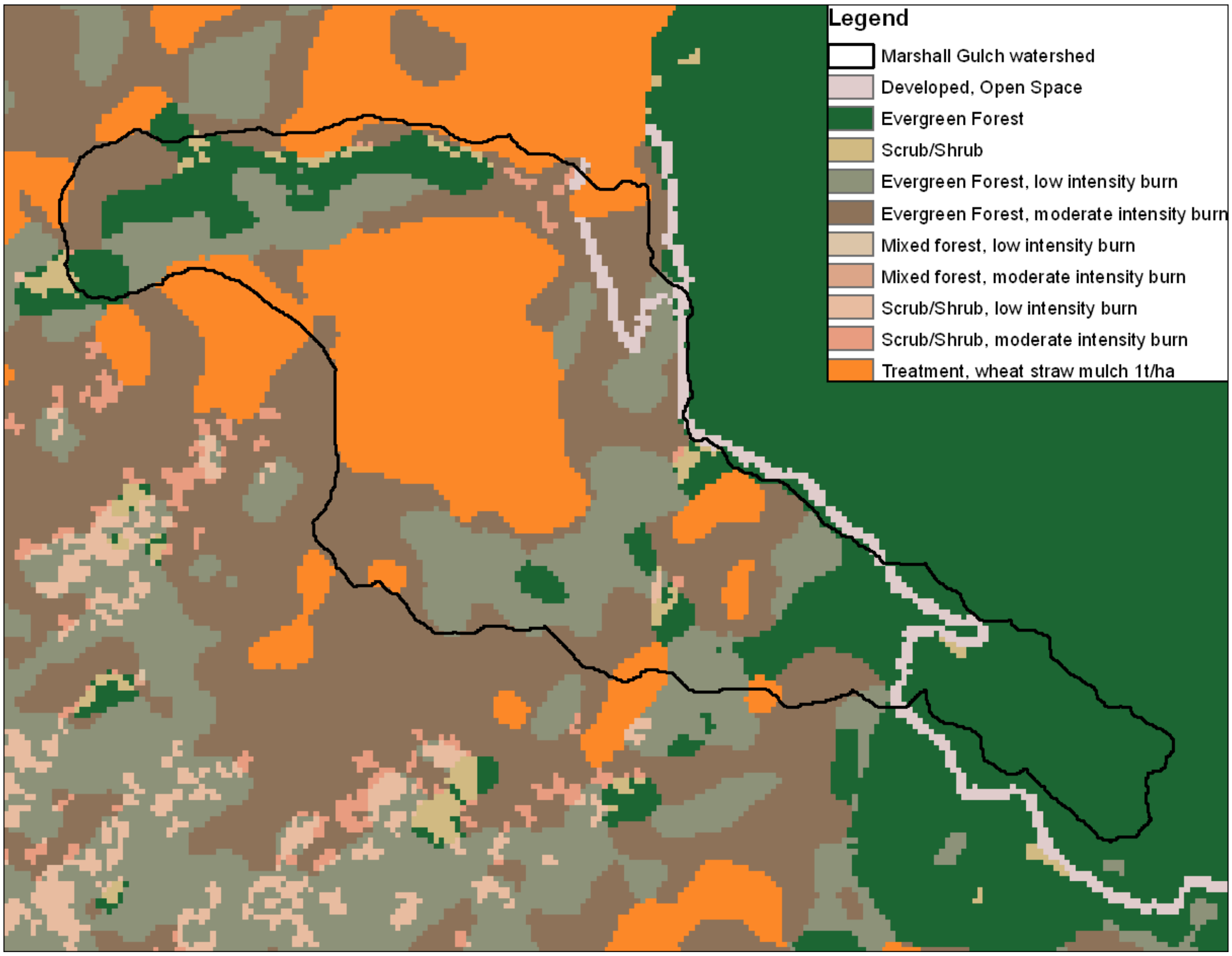
11.4. ***Modification Scenario*** box

11.4.1. ***Single Change*** tab

11.4.1.1. Select **Change entire polygon** radiobutton

11.4.1.2. ***To type***: **Treatment, wheat straw mulch 1t/ha**

11.5. Click ***Process***.



Part 4: Modeling Runoff in Study Area Using Treated, Post-Fire Land Cover

In Part 4, a new parameterization will be created using the treated, post fire land cover created in Part 3, and then it will be used to write a different set of model input files to execute the model.

Step 1: Parameterizing the watershed elements with treated, post-fire land cover

AGWA can store multiple parameterizations in the parameterization look-up tables. Running the parameterization with a different set of options (element, soils, or land cover) will append data to the existing look-up tables instead of overwriting them, so the parameterization can be accessed again at a later time. In a new parameterization, if only one part is different from an existing parameterization, AGWA can copy the parameters from an existing parameterization to save time.

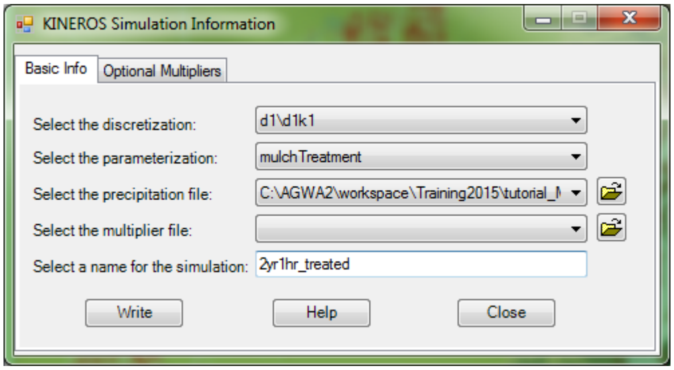
12. Perform the element, land cover, and soils parameterization of the Marshall Gulch watershed by selecting ***AGWA Tools > Parameterization Options > Parameterizer***.
    - 12.1. ***Input*** box
        - 12.1.1. ***Discretization***: **d1\d1k1**
        - 12.1.2. ***Parameterization Name***: **mulchTreatment**
    - 12.2. ***Elements*** box
        - 12.2.1. ***Parameterization***: **post**

          Land cover change is the emphasis of this exercise and no other changes will be made; because no other options are changing, the element parameterization parameters can be copied from an existing parameterization.
    - 12.3. ***Land Cover and Soils*** box
        - 12.3.1. ***Parameterization***: **Create new parameterization**
        - 12.3.2. Click ***Select Options***. The ***Land Cover and Soils*** form opens.
    - 12.4. In the ***Land Cover and Soils*** form
        - 12.4.1. ***Land Cover*** tab
            - 12.4.1.1. ***Land cover grid***: **treated**
            - 12.4.1.2. ***Look-up table***: **mrlc2001_lut_fire**
        - 12.4.2. ***Soils*** tab
            - 12.4.2.1. ***Soils*** layer: **gsmsoilmu_a_az**
            - 12.4.2.2. ***Soils database***: navigate to and select **C:\AGWA\gisdata\tutorial_MarshalGulchRehabiliation\gsmsoil_az\soildb_US_2002.mdb**
    - 12.5. Click ***Continue***. You will be returned to the ***Parameterizer*** form where the ***Process*** button will now be enabled.
    - 12.6. In the ***Parameterizer*** form, click ***Process***.

Step 2: Writing KINEROS input files

The same precipitation files used in the earlier simulations will be used in the treated, post-fire simulations, so the writing of the KINEROS precipitation files performed earlier will be skipped now.

13. Write the KINEROS simulation input files for the watershed by selecting ***AGWA Tools > Simulation Options > KINEROS Options > Write KINEROS Input Files***.



13.1. ***Basic Info*** tab:

13.1.1. ***Select the discretization***: **d1\d1k1**

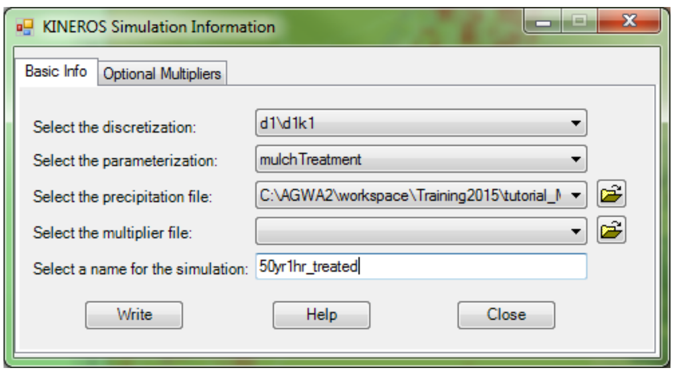
13.1.2. ***Select the parameterization***: **mulchTreatment**

13.1.3. ***Select the precipitation file***:**2yr1hr**

13.1.4. Select a name for the simulation: **2yr1hr_treated**

13.2. Click ***Write***.

14. Repeat the writing of input files for the 50yr1hr event. Select ***AGWA Tools > Simulation Options > KINEROS Options > Write KINEROS Input Files***.



14.1. ***Basic Info*** tab:

14.1.1. ***Select the discretization***: **d1\d1k1**

14.1.2. ***Select the parameterization***: **mulchTreatment**

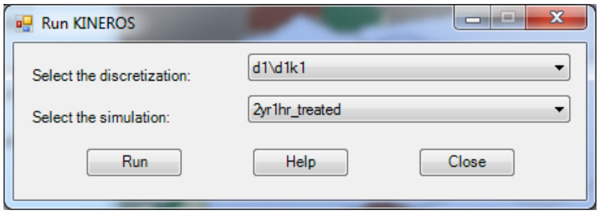
14.1.3. ***Select the precipitation file***: **50yr1hr**

14.1.4. Select a name for the simulation: **50yr1hr_treated**

14.2. Click ***Write***.

Step 3: Executing the KINEROS model

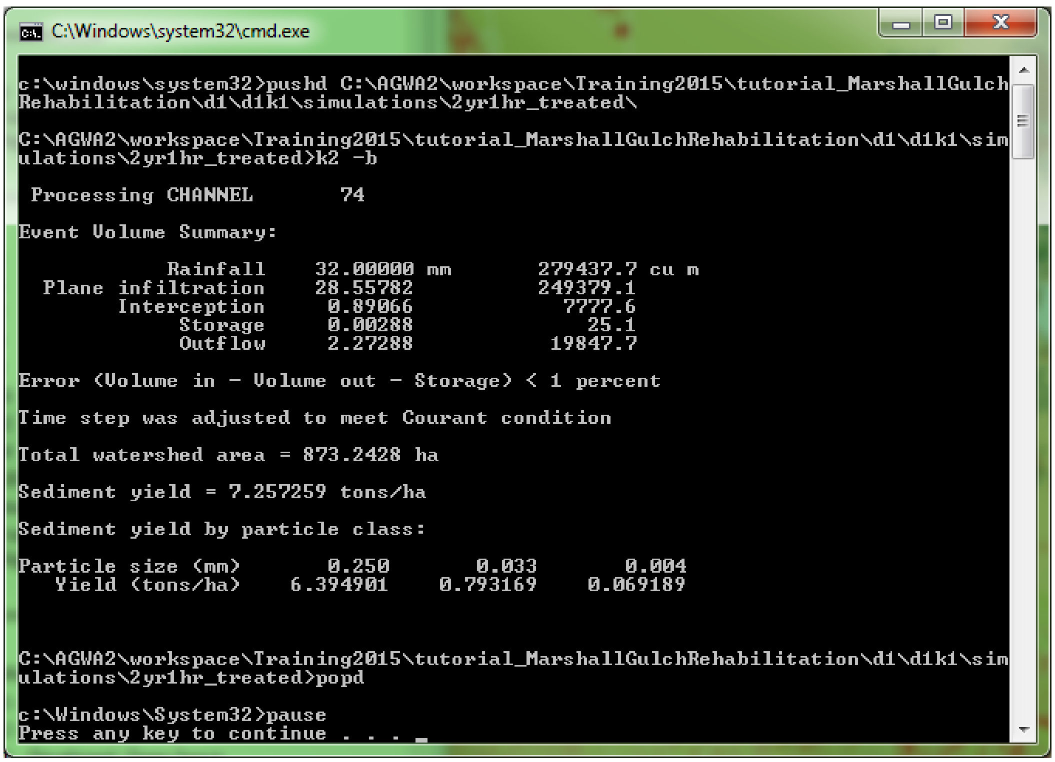
15. Run the KINEROS model for the 2yr1hr event by selecting ***AGWA Tools > Simulation Options > KINEROS Options > Execute KINEROS Model***.



15.1. ***Select the discretization***: **d1\d1k1**

15.2. ***Select the simulation***: **2yr1hr_treated**

15.3. Click ***Run***. The command window will stay open so that successful completion can be verified. Press any key to continue.



16. Repeat for the 50yr1hr event.

16.1. ***Select the discretization***: **d1\d1k1**

16.2. ***Select the simulation***: **50yr1hr_treated**

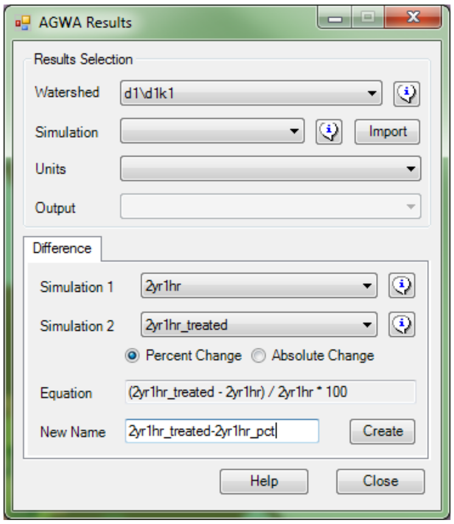
16.3. Click ***Run***. The command window will stay open so that successful completion can be verified. Press any key to continue.

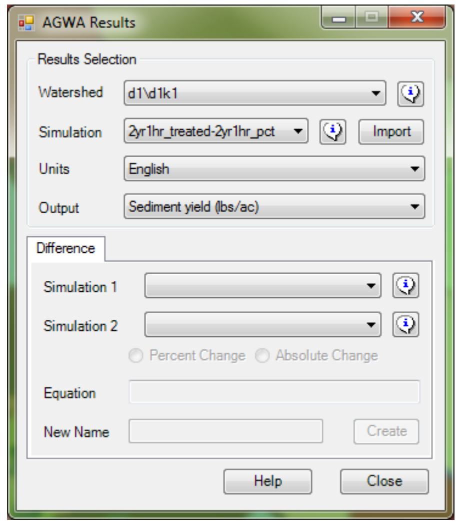
At this point, post-fire and treated, post-fire conditions have been simulated; in part 5, the post-fire and treated, post-fire simulations will be directly compared.

Part 5: Comparing Results from Post-fire and Treated Scenarios

In Part 5, the results from the post-fire and treated, post-fire simulations will be imported into AGWA. These results will then be differenced to visualize how the treatment impacts the hydrology of the watershed.

17. Import the results from the two simulations by selecting ***AGWA Tools > View Results > KINEROS Results > View KINEROS Results***.





17.1. ***Results Selection*** box

17.1.1. ***Watershed***: **d1\d1k1**

17.1.2. ***Simulation***: click **Import**

17.1.2.1. **Yes** to importing ***2yr1hr***

17.1.2.2. **Yes** to importing ***50yr1hr***

17.1.2.3. **Yes** to importing ***2yr1hr_treated***

17.1.2.4. **Yes** to importing ***50yr1hr_treated***

18. Difference the post-fire and treated, post-fire simulation results.

18.1. ***Difference*** tab

18.1.1. ***Simulation1***: **2yr1hr**

18.1.2. ***Simulation2***: **2yr1hr_treated**

18.1.3. Select **Percent Change** radiobutton

18.1.4. ***New Name***: **2yr1hr_treated-2yr1hr_pct**

18.1.5. Click **Create**

18.2. Repeat for the 50yr1hr event.

18.2.1. ***Simulation1***: **50yr1hr**

18.2.2. ***Simulation2***: **50yr1hr_treated**

18.2.3. Select **Percent Change** radiobutton

18.2.4. ***New Name***: **50yr1hr_treated-50yr1hr_pct**

18.2.5. Click **Create**

19. View the differenced results.

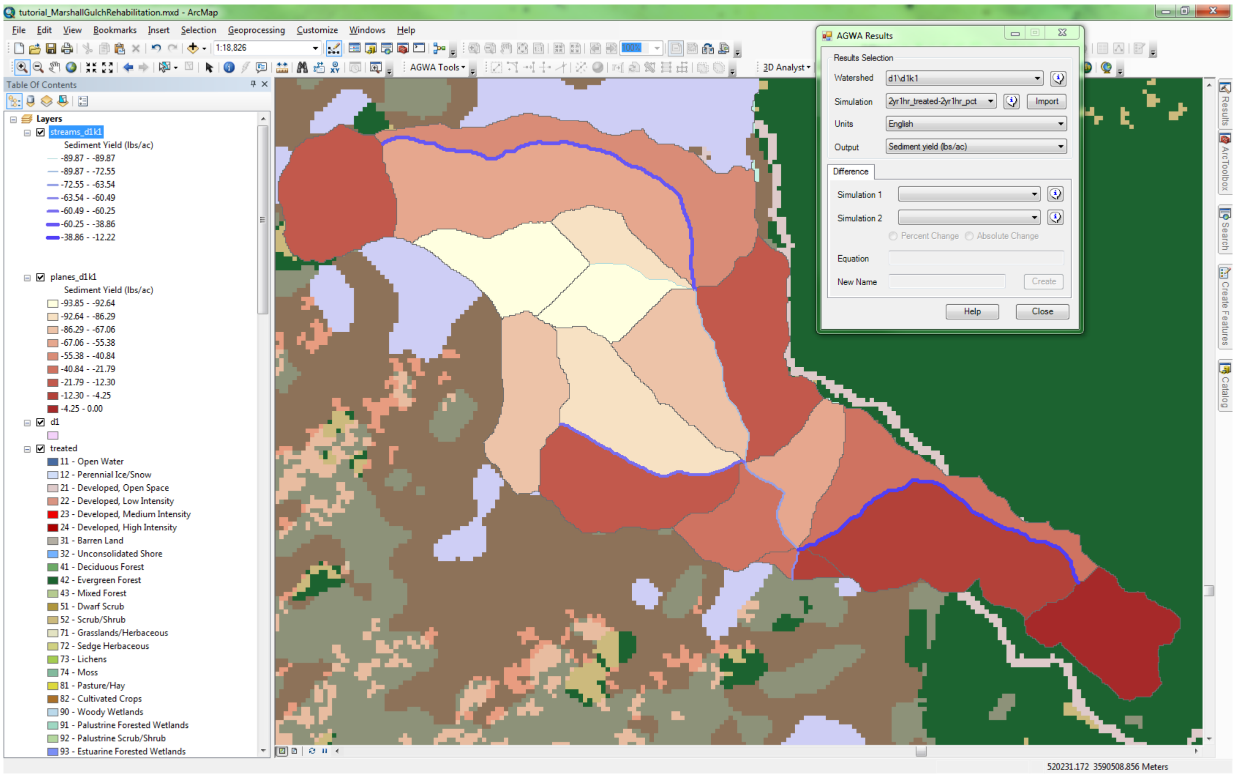
19.1. ***Results Selection*** box

19.1.1. ***Watershed***: **d1\d1k1**

19.1.2. ***Simulation***: **2yr1hr_treated-2yr1hr_pct**

19.1.3. ***Units:*** **English** (Note: unit selection is arbitrary when viewing percent difference)

19.1.4. ***Output***: **Sediment Yield (lbs/ac)**



19.2. Repeat for the 50yr1hr differenced results.

19.3. ***Results Selection*** box

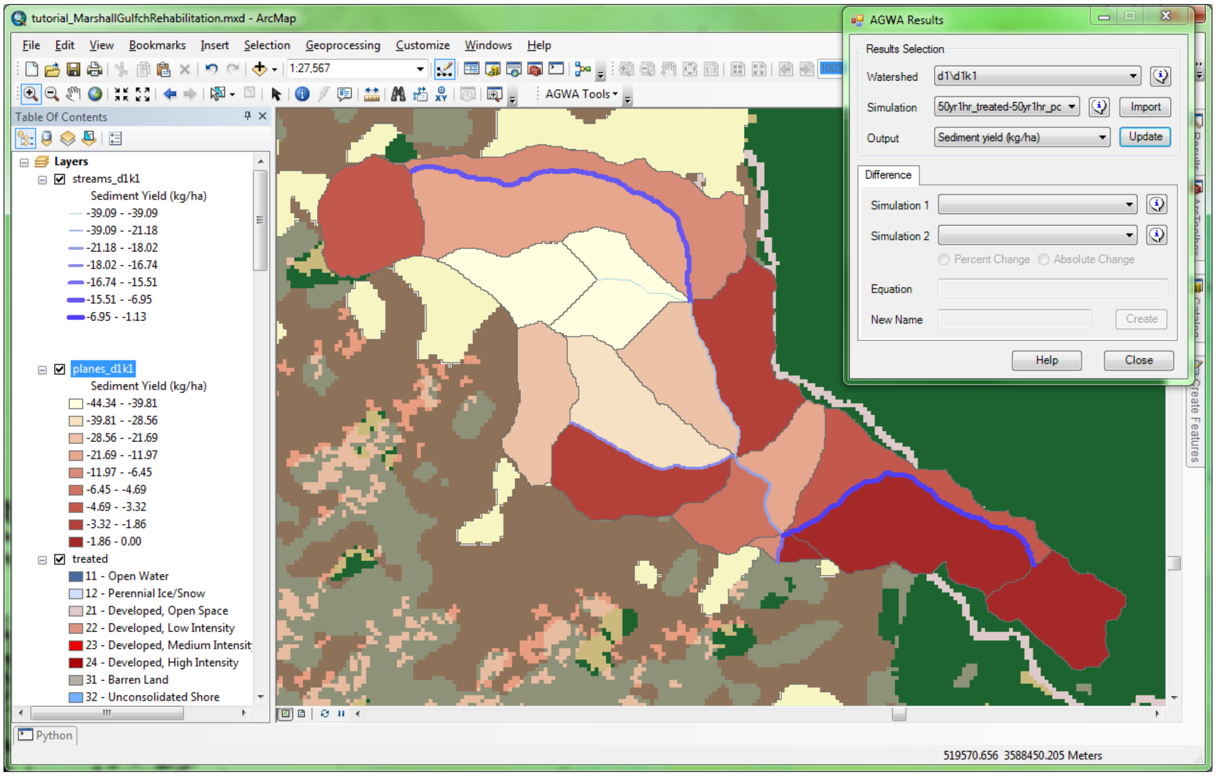
19.3.1. ***Watershed***: **d1\d1k1**

19.3.2. ***Simulation***: **50yr1hr_treated-50yr1hr_pct**

19.3.3. ***Units:*** **Metric**

19.3.4. ***Output***: **Sediment Yield (kg/ha)**

Notice that the areas that experienced the highest burn severity and were given the mulch treatment had the largest percent decrease in sediment yield (the lighter colors).



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